

THE IMPACT OF ARTIFICIAL INTELLIGENCE ON CHATBOT-DRIVEN PERSONALIZATION IN MARKETING COMMUNICATIONS

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Abstract. The article explores the specific features of personalized marketing communications that involve artificial intelligence and next-generation chatbots. The aim of the study is to analyze the typology of modern chatbots and evaluate the effectiveness of their application within personalized marketing strategies. Methodology and methods: the study employed general scientific methods of cognition, including analysis and synthesis; induction and deduction; comparison; generalization; a systems approach; and the modeling method. The research findings show that modern chatbots – especially those based on models like ChatGPT – are advanced technological agents capable of imitating human communication through the use of natural language processing (NLP), machine learning (ML) algorithms, and transformer architectures. Within the proposed typology, chatbots are classified as button-based, scenario-driven, AI-oriented, and messenger-integrated, each serving specific functions depending on business objectives and the selected marketing strategy. From a technical standpoint, three primary chatbot architectures are identified: generative (GPT); retrieval-based (RAC); and hybrid models that combine accurate information retrieval with the adaptability of language modeling. The study also highlights the drawbacks of AI-driven personalized communication, which include generating irrelevant responses; overlooking emotional context; and having limited ability to tailor communication styles to individual users. These shortcomings can lead to a loss of consumer trust, reputational risks, and legal implications associated with breaches of ethical standards and regulatory requirements, including provisions of the EU Artificial Intelligence Act. The research concludes that A/B testing serves as a key tool in mitigating such risks by enabling empirical comparison of the effectiveness of different personalized interaction strategies. This approach makes it possible to flexibly tailor chatbot responses to the needs of specific audience segments based on factors such as tone, formality, emotional nuance, and contextual depth. The practical contribution of this research lies in offering a structured framework and applied recommendations for enhancing the effectiveness of AI-powered personalized marketing communications.

Keywords: chatbots, personalization, artificial intelligence, marketing communications, A/B testing.

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Introduction

In the current era of digital transformation of business processes, a key factor in the effectiveness of marketing communications is the ability of companies to ensure timely, scalable, and personalized interaction with their target audience. In this context, artificial intelligence (AI) tools – particularly chatbots – are increasingly integrated into companies' digital strategies as communication intermediaries. Statistics indicate a consistently high usage rate of chatbots among consumers: in 2022 and 2023, 88% of users interacted with AI bots at least once, reflecting a solid level of trust in the technology. Moreover, 96% of respondents are already familiar with the existence of chatbots, confirming their integration into modern digital services [4].

Given these trends, AI-powered chatbots have evolved beyond simple automation tools into powerful means of shaping a new kind of customer experience – one that is interactive, dynamic, and personalized. These technologies not only improve the efficiency of request processing but also enable the creation of individualized interaction pathways for each customer, which is essential for marketing differentiation. This makes it necessary to conduct an interdisciplinary scientific analysis of the phenomenon, situated at the intersection of marketing, cognitive science, computational linguistics, and information technology [4].

In addition to facilitating real-time communication, AI is increasingly used to generate and adapt content, enabling a high level of personalization. According to a study by SurveyMonkey, 73% of respondents consider artificial intelligence a central element in creating a personalized customer experience. Specifically, 51% use AI to optimize content for email marketing and SEO; 50% apply it to generate copy aligned with strategic marketing goals; and 41% rely on AI for data analysis to identify insights for personalized communication. These figures confirm the pivotal role of AI in transforming the functional landscape of marketing activities [1].

Despite growing attention, the topic of personalized marketing communications involving artificial intelligence and chatbots remains insufficiently covered in academic literature. Although some aspects have been explored in individual studies, most available sources come in the form of online publications, reviews, blogs, or commercial reports. This suggests a predominantly applied nature of the research, with academic contributions still in need of development.

Literature Review. Notable contributions to the understanding of the topic's current state have been made by authors such as F. Aslam [3], I. Dergaa, H. Ben Saad et al. [5], and Prerna P. and N. Singh [8], who examine both technical and social aspects of chatbot use, their evolution, and influence on consumer behavior. Key insights into trends in AI-driven marketing communications are also provided by expert sources such as the Digital Marketing Institute [1], Botpress [4], Zapier [9], JustThink.ai [10], and Yellowfin BI [11], which help identify relevant approaches, performance metrics, technological innovations, and changes in user perception of digital services.

Therefore, although there is a considerable number of publications addressing specific aspects of personalized marketing communications via AI, there is a noticeable lack of structured academic material on the subject. For this reason, various scientific methods have been applied to analyze, group, and systematize information within the scope of the research topic.

The purpose of the article is to identify the specific features of using artificial intelligence and chatbots in personalizing marketing communications, with a focus on architectural solutions, cognitive risks, and optimization tools such as A/B testing. In order to achieve this goal, the following tasks will be carried out during the study: the concept of reactive marketing will be characterized, and the role of chatbots as tools for real-time personalized communication will be defined; the typology and functional classification of chatbots will be

analyzed based on their technological complexity and application domains; the main personalization errors in chatbot-user interactions will be identified; the role of A/B testing as a tool for improving personalized communication quality will be outlined.

Research results

Chatbots, or artificial conversational agents, are computer programs designed to imitate human language in order to communicate via text or voice interfaces. Initially, chatbots were developed to solve limited communicative tasks, but with advancements in artificial intelligence, natural language processing (NLP), and deep learning, their functionality has expanded significantly. The historical starting point in chatbot development is generally considered to be ELIZA, created in 1966 by Joseph Weizenbaum, which used pattern-matching techniques to simulate a psychotherapeutic dialogue [8]. This was followed by PARRY (1972), which modeled the behavior of a patient with paranoid disorders, and Jabberwacky (1981), focused on generating entertaining conversations. A systematic review of chatbot development shows a gradual shift from rigid scenarios to flexible systems based on next-generation language models like GPT-3 (2020), which are capable of generating coherent text with contextual awareness [11].

Today, chatbots have become essential tools in implementing personalized marketing strategies, particularly in the context of real-time reactive marketing. Reactive marketing involves timely, contextually relevant interaction with customers, often based on their behavior, intentions, or queries. AI-powered chatbots offer continuous availability, flexible content adaptation, and rapid responses to shifting customer behavior patterns. Through integration with CRM systems and analytics tools, these agents can personalize messages based on purchase history, demographic data, or even a user's emotional state, thereby increasing the effectiveness of marketing efforts [8].

The key functions of chatbots in personalized marketing include real-time audience segmentation; dynamic content adaptation; user experience (UX) support; and the generation of relevant recommendations based on AI. They can automatically model the sales funnel according to specific consumer behavior and adapt communication strategies within a single conversation. For example, if a user shows interest in a particular product category, the chatbot immediately offers special deals, additional information, or personalized discounts. This level of responsiveness enables the implementation of reactive marketing, allowing companies to act proactively and build value-based relationships with customers at the moment their needs arise [11].

Effective implementation of chatbots in marketing, service, or educational environments requires a thorough understanding of their typology and functional potential. Based on technical complexity and level of intelligence, four main types of chatbots are distinguished: menu-based, script-driven, AI-powered, and message bots [2].

Menu- or button-based chatbots represent the simplest type, using predefined response options or navigation buttons. Interaction is limited to selecting from available choices, which minimizes misunderstanding but also restricts conversational flexibility. These bots are particularly effective for basic tasks such as answering frequently asked questions (FAQs); navigating websites; or providing reference information [2].

Script-driven chatbots operate based on predefined rules and dialogue flows. They can recognize keywords or patterns in user input and respond with a prewritten message. Compared to button-based bots, they offer slightly more flexible interaction and can handle a wider range of topics, though they remain limited by their scripted responses. They are generally ineffective in managing complex or unexpected queries [2].

AI-powered chatbots are the most advanced type, built on natural language processing (NLP) and machine learning (ML) technologies. These bots can analyze, interpret, and

generate text in real time, taking into account both context and conversation history. AI chatbots are capable of adapting to the user's communication style; offering personalized advice; managing complex dialogues; resolving ambiguous queries; and detecting emotional tone. They serve as the foundation for modern systems such as ChatGPT, Copilot, or Claude [2].

Message bots function within popular messaging platforms such as WhatsApp, Facebook Messenger, Telegram, and others. These bots can range from simple button-based systems to full-fledged AI agents [2].

Designing a chatbot requires selecting the appropriate architecture, which determines the system's flexibility, learning capability, and level of communication personalization. The most common approaches include generative models (such as GPT); retrieval-based systems (RAC); and hybrid architectures that combine the strengths of both.

Generative architectures (GPT) models like GPT (Generative Pre-trained Transformer), including GPT-3 and GPT-4, generate text using deep transformer networks with billions of parameters. These models are pretrained on massive datasets and can tailor responses based on dialogue history, linguistic style, and logical structure of the request. Key advantages of GPT models include deep contextualization; flexible response generation; ability to create new content; and emotional adaptability to the user [2].

Retrieval-based chatbots (RAC) search structured knowledge bases or relevant documents. They are commonly used in button-based or script-driven systems. The process includes intent detection; forming a relevant query; extracting information fragments; and constructing a response based on retrieved content. This approach provides high accuracy in domain-specific contexts, such as finance or medicine, where factual correctness is critical. However, RAC systems fall short in dialogue flexibility and style personalization compared to generative models [2].

Hybrid architectures combine both generative and retrieval-based methods. These systems first retrieve relevant content, then use a large language model (LLM) to generate a personalized response. This approach is especially effective in personalized marketing, as it ensures factual accuracy; allows communication style adaptation; and utilizes CRM data or real-time behavioral insights.

Today, marketing strategists can choose from dozens of platforms offering chatbot implementation using different architectural models (table 1).

Table 1 – Most common chatbots of 2025

Chatbot / Platform name	Optimal use case	Model / Architecture
ChatGPT (OpenAI)	General use, text and image generation	GPT (o1/o3), DALL·E 3
Claude (Anthropic)	Document processing, creative interfaces (Artifacts)	Claude Haiku, Sonnet, Opus
Google Gemini	Integration with Google Workspace, coding, image generation	Gemini 1.5, Imagen
Microsoft Copilot	Office productivity, integration with Microsoft 365	GPT (from OpenAI)
DeepSeek	Advanced reasoning and open research	DeepSeek V3, R1
Meta AI (Llama)	Use in social media, experimentation with open models	Llama 2 / Llama 3
Perplexity	Deep search, learning, data analysis	GPT, Claude, DeepSeek

Poe (Quora)	Testing multiple models in one environment	GPT, Claude, Gemini, Llama, Mistral, StableDiffusionXL
Le Chat Mistral	Simplicity, easy access to models	Mistral
Zapier Chatbots	Custom chatbot creation and automation	OpenAI
Zapier Agents	Task automation via agent systems	OpenAI
HuggingChat	Experimentation with open-source models	Open models from Hugging Face
Grok (X, formerly Twitter)	Platform X interaction, rapid information delivery	Grok Series
Pi (Inflection AI)	Personal conversations, empathetic interaction	Inflection-2.5
you.com Chat	Alternative to GPT platforms with broader model options	GPT, Claude, Llama, DBRX
Personal AI	Creation of personalized AI personas for business	GGT-P (proprietary), GPT, Claude
Merlin AI	Fast AI access via browser	GPT, Claude, Gemini, Mistral
ZenoChat	Personal productivity, time management	Sophos 2, GPT, Claude, Llama

Note: systematized by the author based on research [9]

Despite the high potential of AI-based chatbots in the field of personalized marketing, the operation of such systems is not without risks. In particular, personalization errors can have critical consequences for user trust, communication effectiveness, and a company's legal liability. One of the main issues is the generation of irrelevant or overly generalized responses, which contradicts user expectations for a tailored approach. As shown in the empirical study by Doris L. and Potter K., customer frustration significantly increases when chatbots fail to consider context or the user's emotional state – especially during interactions under stress [6]. This lack of sensitivity to conversational context not only lowers satisfaction but also undermines the effectiveness of marketing engagement.

Another concern lies in the limited or inaccurate understanding of complex queries that fall outside standard scripts. Personalization delivered through outdated or undertrained models may result in inappropriate recommendations, leading to user distrust. For example, the dissemination of outdated or false information – caused by opaque algorithms and limited control over training data – poses a serious threat, particularly in high-risk domains such as healthcare or finance [7].

In this context, it is essential to consider regulatory frameworks that are increasingly being implemented at the international level. A notable example is the EU Artificial Intelligence Act, which outlines principles of transparency, ethical responsibility, data protection, and documentation of training data sources. High-risk systems, including personalized AI chatbots, are required to undergo mandatory risk assessments, including evaluation of potential privacy violations and behavioral influence on users [7]. Ignoring these requirements can result in financial penalties –up to 7% of a company's global turnover.

Beyond legal risks, personalization errors may lead to reputational damage that is difficult to repair. Findings from the study [6] indicate that consumers respond more favorably to hybrid communication models, where complex queries are escalated to human

agents. This highlights the need not only for technological excellence but also for ethical flexibility in executing personalized interactions.

In the process of integrating AI-based personalized solutions into marketing communications, A/B testing (or split testing) becomes particularly relevant. This approach involves comparing at least two variations of communication content (e.g., chatbot response style, response time, emotional tone, formality level, or degree of personalization) across different audience segments to identify the most effective version based on specific metrics – such as user satisfaction, conversion rate, engagement depth, or trust level.

Changing consumer expectations, including the growing demand for natural dialogue and instant service access, make A/B testing an indispensable tool for validating hypotheses on the effectiveness of personalized AI interfaces. Statistics show that 29% of respondents expect 24/7 access to chatbots, while 47% have mistaken a bot for a human at least once [4], which underscores the need for precise personalization calibration through empirical methods like A/B testing. This approach helps avoid pitfalls such as overloading the conversation with personal elements or, conversely, depersonalizing it – both of which can cause cognitive discomfort or disappointment [5].

A/B testing also serves a compensatory function in addressing regulatory challenges related to algorithmic transparency and imperfections in personalization. According to EU regulatory requirements, particularly under the AI Act, personalized chatbots must align with principles of ethics, transparency, and accountability, including documentation of training data sources and mitigation of misinformation risks [7]. Running A/B tests within such systems allows for the identification of versions that yield lower interaction quality or fail to meet user expectations regarding accuracy, relevance, or communication style – critical factors in evaluating high-risk AI systems.

In addition, A/B testing helps balance the cognitive load that AI communications impose on users. Research suggests that intensive chatbot use can lead to cognitive inertia or over-reliance on the system. Comparing different communication variants (e.g., depth of explanation, presence of empathetic elements, or motivational strategies for independent decision-making) supports the development of interaction models that encourage critical thinking while maintaining high levels of comfort and emotional engagement.

Thus, A/B testing functions not only as a tool to enhance marketing performance but also as a methodological foundation for implementing ethical, legal, and cognitively safe approaches to personalization in AI-chatbot user interactions.

Within the framework of this study, a **structured conceptual model** is proposed for formulating applied recommendations aimed at enhancing the effectiveness of personalized marketing communications driven by artificial intelligence and chatbot technologies. This model is designed to ensure not only the technical implementation of personalization but also the integration of behavioral, communicative, and normative dimensions of user interaction.

The proposed framework comprises **four interrelated levels**:

- the analytical–profiling level,
- the strategic–communicative level,
- the architectural–functional level, and
- the regulatory–ethical level.

Each level serves a distinct function in the overall personalization process and incorporates corresponding technological and procedural instruments to ensure adaptability, efficiency, and compliance with ethical and legal standards.

Table 2 - Structured Framework Model for Enhancing the Effectiveness of AI-Based Personalized Marketing Communications

Model Level	Functional Objective	Key Tools / Approaches
1. Analytical–Profiling Level	Collecting, processing, and interpreting user data to build individualized user profiles	Machine learning, clustering, sentiment analysis, behavioral triggers, integration with CRM/CDP systems
2. Strategic–Communicative Level	Designing contextually appropriate personalized communication strategies	UX communication design, reactive marketing, emotional tone calibration, adaptive linguistic style
3. Architectural–Functional Level	Selecting and implementing the chatbot’s system architecture	Generative models (e.g., GPT), retrieval-based systems (RAC), hybrid solutions, API-based platform integration
4. Regulatory–Ethical Level	Ensuring compliance with legal standards, ethical norms, and transparency in personalization	EU AI Act, A/B testing, algorithmic auditing, training data documentation, human fallback mechanisms for escalation

Note: systematized by the author

The implementation of this structured model provides a comprehensive and systematic basis for the development of AI-driven personalized marketing systems. It enhances not only the technological robustness of chatbot communications but also their responsiveness, user-centricity, and regulatory alignment.

Conclusions

The study has established that modern chatbots, particularly those based on models like ChatGPT, are high-tech artificial agents capable of imitating human communication through natural language processing (NLP), machine learning (ML), and transformer-based architectures. From a typological perspective, chatbots are categorized as button-based, script-driven, AI-oriented, and messenger-based, each serving specific functions within business processes and marketing strategies. Architecturally, they are divided into generative models (GPT); retrieval-based systems (RAC); and hybrid solutions that combine the precision of information retrieval with the flexibility of language modeling.

At the same time, it has been found that personalized user interaction can involve a range of typical errors, the most common being: generation of irrelevant responses; ignoring emotional context; and insufficient adaptation to individual communication styles. These issues can lead to reduced trust in the brand, reputational risks, and legal consequences related to noncompliance with ethical and regulatory standards (particularly the EU AI Act). To minimize such risks, A/B testing plays a critical role by empirically assessing the effectiveness of personalized communication strategies through the comparison of alternative interaction approaches. This method allows for the adaptation of response styles, formality levels, contextual depth, and emotional tone to align with the expectations of specific target audience segments.

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